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PyTrx: a Python-based monoscopic terrestrial photogrammetry toolset for glaciology

Penelope How^{1,2}, Nicholas Hulton², Lynne Buie², and **Douglas Benn**³

¹Department of Remote Sensing, Asiaq Greenland Survey, Greenland (how@asiaq.gl)

²School of GeoSciences, University of Edinburgh, Edinburgh, UK

³School of Geography and Sustainable Development, University of St. Andrews, St Andrews, UK

Terrestrial photogrammetry is a growing method for deriving measurements from contemporary and historical imagery of glacial environments, providing unique insights into glacier change at a high spatio-temporal resolution. However, the potential usefulness of terrestrial image data is currently limited by the unavailability of user-friendly toolsets that contain all the photogrammetry processes required. PyTrx is presented here as a Python-alternative toolset to widen the range of monoscopic photogrammetry (i.e. from a single viewpoint) toolsets on offer to the glaciology community. The toolset holds core photogrammetric functions for template generation, feature-tracking, object identification, image registration, and georectification (using a planar projective transformation model), which can be performed on both contemporary and historical imagery. Examples of PyTrx's applications are demonstrated using contemporary time-lapse imagery, including ice flow velocities, surface areas of supraglacial lakes and meltwater plumes, and glacier terminus profiles.